

Landolt-Börnstein

Numerical Data and Functional Relationships in Science and Technology

New Series / Editor in Chief: W. Martienssen

Group II: Molecules and Radicals

Volume 26

Magnetic Properties of Free Radicals

Subvolume A: Inorganic Radicals, Metal Complexes and
Nonconjugated Carbon Centered Radicals

Part 2

Editor: H. Fischer

Authors: W. Kaim, B. Schwederski

 Springer

ISSN 1615-1852 (Molecules and Radicals)

ISBN-10 3-540-43277-9 Springer Berlin Heidelberg New York
ISBN-13 978-3-540-43277-7 Springer Berlin Heidelberg New York

Library of Congress Cataloging in Publication Data:
Landolt-Börnstein: Numerical Data and Functional Relationships in Science and Technology, New Series.
Editor in Chief: W. Martienssen.
Group II, Volume 26: Magnetic Properties of Free Radicals.
Subvolume A: Inorganic Radicals, Metal Complexes and Nonconjugated Carbon Centered Radicals. Part 2.
Edited by H. Fischer.
Springer-Verlag, Berlin, Heidelberg, New York 2006.
Includes bibliographies.
1. Physics - Tables. 2. Chemistry - Tables. 3. Engineering - Tables.
I. Börnstein, Richard (1852-1913). II. Landolt, Hans (1831-1910).
QC 61.23 502'.12 62-53136

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilm or in other ways, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer-Verlag. Violations are liable for prosecution act under German Copyright Law.

Springer is a part of Springer Science+Business Media
springeronline.com
© Springer-Verlag Berlin Heidelberg 2006
Printed in Germany

The use of general descriptive names, registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

Product Liability: The data and other information in this handbook have been carefully extracted and evaluated by experts from the original literature. Furthermore, they have been checked for correctness by authors and the editorial staff before printing. Nevertheless, the publisher can give no guarantee for the correctness of the data and information provided. In any individual case of application, the respective user must check the correctness by consulting other relevant sources of information.

Cover layout: Erich Kirchner, Heidelberg
Typesetting: Authors and Redaktion Landolt-Börnstein, Darmstadt
Printing and Binding: AZ Druck, Kempten (Allgäu)

SPIN: 1069 2621 63/3020 - 5 4 3 2 1 0 – Printed on acid-free paper

Editor

Fischer, Hanns †

Physikalisch-chemisches Institut, Universität Zürich, Zürich, Switzerland

Prof. Dr. Hanns Fischer passed away on February 22, 2005.

Authors

Kaim, Wolfgang

Institut für Anorganische Chemie, Universität Stuttgart, Stuttgart, Germany

Schwederski, Brigitte

Institut für Anorganische Chemie, Universität Stuttgart, Stuttgart, Germany

Landolt-Börnstein

Editorial Office

Gagernstraße 8

D-64283 Darmstadt, Germany

fax: +49 (6151) 171760

e-mail: Landolt-Boernstein@springer.com

Internet

<http://www.landolt-boernstein.com>

Preface

Volume II/26 supplements the previous compilations II/1, II/9 and II/17 of the magnetic properties of free radicals which were published in 1965, 1977–1980 and 1986–90. In the form of books and CD ROM it covers the literature from about 1985 to 2001. Due to the still rapid growth of the field and the necessary inclusion of new subjects the volume is divided into subvolumes which will appear in fast succession. Together with the earlier publications volume II/26 offers an up-to-date and comprehensive survey and collection of structures and data on the important chemical intermediates, namely radicals, polyradicals and related species such as carbenes, nitrenes, etc. As before the species have been grouped according to chemical aspects. The contents of the individual subvolumes are indicated on the inside of the front covers. For each group of substances the literature has been compiled and extracted by experts in the fields. A small overlap between the chapters is intentional and allows a maximum of coherence and comprehensiveness of the display. For the reader's convenience an index of substances follows in the last subvolume. Data retrieval is also facilitated by helpful links in the CD ROM version. We wish to thank all the authors for their careful and experienced work and the most agreeable cooperation, the Landolt-Börnstein office, especially Mrs. A. Endemann, for the layouts and the untiring and careful checking of manuscripts and galley proofs, and Springer-Verlag for the customary care in the preparation of the volume which is published without external financial support.

Zürich, December 2003

The Editor

Table of contents

Magnetic Properties of Free Radicals

Subvolume A: Inorganic Radicals, Metal Complexes and Nonconjugated Carbon Centered Radicals

Part 2

I Introduction

I	General introduction [H. Fischer].	1
A	Definition and substances	1
B	Magnetic properties	1
C	Arrangements of the tables	3
D	Monographs, reviews and important conference proceedings	4

II Data

3	Radicals in metal complexes [W. Kaim, B. Schwederski]	7
3.1	Introduction	7
3.1.1	Scope of the substances included and presentation	7
3.1.2	Arrangement.	7
3.1.3	Literature	7
3.1.4	Index of abbreviations.	8
3.2	Complexes of group 1 (Li, Na, K, Rb, Cs)	9
3.3	Complexes of group 2 (Be, Mg, Ca, Sr, Ba)	65
3.4	Complexes of group 3 (Sc, Y, La), lanthanides and actinides	75
3.5	Complexes of group 4 (Ti, Zr, Hf)	82
3.6	Complexes of group 5 (V, Nb, Ta)	87
3.7	Complexes of group 6 (Cr, Mo, W).	89
3.8	Complexes of group 7 (Mn, Tc, Re)	118
3.9	Complexes of group 8 (Fe, Ru, Os).	159
3.10	Complexes of group 9 (Co, Rh, Ir)	195
3.11	Complexes of group 10 (Ni, Pd, Pt).	213
3.12	Complexes of group 11 (Cu, Ag, Au).	244
3.13	Complexes of group 12 (Zn, Cd, Hg).	261
3.14	Complexes of group 13 (B, Al, Ga, In, Tl)	285
3.15	Complexes of group 14 (Ge, Sn, Pb)	316
3.16	Complexes of group 15 (Sb, Bi)	327
3.17	References for 3.	329

III General symbols and abbreviations

A	Symbols	342
B	Abbreviations	342
C	Substances or part of substances	343